Measurement and validation of a three factor hierarchical model of competitive anxiety

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Abstract

Objectives: A novel analytical framework was used to re-examine and extend Cheng, Hardy and Markland's (2009) hierarchical model of anxiety. The modified model was characterized by six first order constructs, with worry, private self-focus and public self-focus representing cognitive anxiety, somatic tension and autonomous hyperactivity representing physiological anxiety and perceived control representing the regulatory dimension. It was hypothesized that these six first order constructs were formative indicators of the second order factors and this hypothesis was tested using Partial Least Squares analysis. Factor validity of the original hierarchical model proposed by Cheng et al. was investigated. Subsequently, items were refined, the hierarchical model extended, and factor and predictive validity investigated further.

Method: Prospective data was collected from three samples (N= 174, 516, 43), and a series of factor analyses were conducted including Confirmatory Factor Analysis and Partial Least Squares modeling. Multivariate analysis examined the predictive validity of the model using a performance measure as the dependent variable.

Results: The original model revealed a poor fit, with poor item loadings and discriminant validity. Subsequent analysis established a refined 25 item measure, which produced support for a fully differentiated hierarchical model of competitive anxiety. MANOVA revealed a significant effect for the control factor, with those achieving superior performance reporting significantly higher levels of perceived control.

Conclusions: A fully differentiated hierarchical model was supported, which crucially depicts the first order factors of competitive anxiety that form the three second order dimensions. This provides a model that is a better fit with theory and provides a more refined diagnosis tool for applied sport psychologists.

Measurement and validation of a three-factor hierarchical model of competitive anxiety

Sport psychology researchers have invested effort and resources developing theories and models that best represent the competitive anxiety response and its impact on performance. Much of this research has attempted to provide mechanistic theories to explain why individuals may perform well under pressure whilst some others may suffer from poor performance. The results of this research have produced a mixed pattern of findings, with some supporting self-focus theories, for example, conscious processing hypothesis (Gucciardi & Dimmock, 2008), some supporting motivational processes, such as effort withdrawal (Hardy & Parfitt, 1991), others supporting an attentional explanation (Mullen, Hardy, & Tattersall; 2005; Wilson et al., 2007), whilst still others have produced equivocal results (Mullen & Hardy, 2000). Researchers (e.g. Cooke, Kavussanu, McIntyre, Boardley, & Ring, 2011) have also investigated alternative processes that might account for impaired performance, including physiological responses (e.g., muscle activity) and kinematic variables (e.g., acceleration). Researchers have now suggested that many of these theories and processes may indeed occur in parallel or at separate times during performance. Echoing Eysenck's (1988) suggestion that anxiety-related performance failure might be attributable to multiple causes, Mullen et al. (2005) suggested that such impairment might be caused by both attentional and conscious processing effects. Traditionally, however, research has focused on examining these processes in isolation. This may be one reason for the equivocal results, thus, researchers would be better placed attempting to tease apart the underlying aspects of anxiety that may trigger these processes, for example, excessive worry, attentional narrowing, self-focus, or changes in effort expenditure. Current measurement models do little to represent these processes; therefore, developing a model that accounts for these aspects of the competitive anxiety response is of clear importance. Adopting a more fine-grained measurement of anxiety processes would aid researchers investigating the mechanistic effects of competitive anxiety on performance as well as allowing applied practitioners to individualise pressure training interventions.

Cheng, Hardy, and Markland (2009) attempted to address this issue by presenting a new measure of performance anxiety supported by a strong conceptual framework that emphasized the multidimensional nature of the performance anxiety response. Rather than use the more global term performance anxiety, we have used the more specific focused term *competitive anxiety* to refer to the competitive state anxiety construct that is being measured in the studies reported here. Cheng et al.'s model consisted of three dimensions; cognitive anxiety, physiological anxiety and a regulatory dimension, which was included to reflect the adaptive nature of the anxiety response. The model also adopted a differentiated approach to the cognitive and physiological dimensions to try and account for the unique processes involved within these dimensions. The resulting conceptual model consisted of three higher order dimensions that were reflected by five lower order subcomponents; cognitive anxiety reflected by worry and self-focused attention; physiological anxiety, reflected by autonomic hyperactivity and somatic tension and a regulatory dimension that included a single subcomponent of perceived control (please see Cheng et al., 2009, for further detail on these subcomponents). Cheng et al. developed their Three Factor Anxiety Inventory (TFAI) to test the proposed hierarchical model. Initial testing with two independent sample groups using retrospective data did not support the hypothesized model; more precisely, worry and self-focus, and somatic tension and autonomic hyperactivity had to be merged into two single factors to produce a good three factor fit, with predictive validity established in subsequent research (Cheng, Hardy, & Woodman, 2011; Cheng & Hardy, 2016). Of particular note in these studies was the key role played by the regulatory dimension, an essential part of the framework as it reflects the adaptive potential of the anxiety response. Given the resurgence of interest in the construct of self-control, the inclusion of the regulatory dimension may be the most contentious component of Cheng et al.'s (2009) model. However, this dynamic aspect of the anxiety response is essential as it helps move conceptualizations away from intensity-only approaches that have been unable to reliably predict performance. As noted by Cheng et al. (2009), a regulatory or adaptive capacity has been proposed in previous models of anxiety (Eysenck, Derakshan, Santos, & Calvo, 2007; Carver & Scheier, 1988) and wider emotional frameworks (Izard & Ackerman, 2000). Cheng et al. (2011) found that the regulatory dimension had main and interactive effects on sports performance such that high perceived control was associated with better performance and best versus worst performance was associated with highest versus lowest perceived control, respectively. Cheng and Hardy (2016) presented further evidence for the role of the regulatory dimension by establishing relationships between perceived control and the adaptive dimensions of perfectionism, self-talk and approach coping, adding further to the construct validity of the model. Consequently, it would appear important to include the regulatory dimension in ongoing tests of the three-dimensional model.

In sum, the work of Cheng and associates represents a significant step forward in the stress and performance literature, providing evidence for the only model to date that has attempted to present a more holistic representation of the anxiety response. The model provides some support for the three major processes activated in the dynamics of the anxiety response; however, Cheng et al. noted that further investigation using prospective data was needed to support the fully differentiated hierarchical model that was originally proposed. The purpose of the present series of studies is to extend Cheng et al.'s original model. Specifically, we re-examined the multidimensional nature of the cognitive dimension, and specifically the self-focus factor. Cheng's original model represents self-focus as a unidimensional construct, but on closer inspection of the self-focus items used, it is clear that they relate to two unique factors consistent with Fenigstein, Scheier, and Buss's (1975) model, which differentiates between private and public self-focus. Fenigstein et al. defined private self-focus as being "concerned with attending to one's inner thoughts and feelings" (p. 523) and public self-focus as "a general awareness of the self as a social object that has an effect on others" (p.523). Cheng et al.'s (2009) model appears to conflate these two distinct aspects of self-focus as both are represented among the items comprising the cognitive dimension of their TFAI. For example, "I find myself evaluating myself more critically than usual" is indicative of a private self-focus, whilst "I am very aware of the possibility of disappointing important others" is indicative of a public self-focus. Despite using items derived from conceptually distinct sources of self-focus, Cheng et al. made no formal distinction between private and public self-focus, rather the two aspects were combined in a unidimensional self-focus construct.

The distinction between private and public self-focus could be especially pertinent as the psychological underpinnings and behavioural effects of these two states are different. Private self-focus serves to clarify and intensify the affect, motives, or personal standards that are currently salient to that individual (Fenigstein, Scheier, & Buss, 1975). Thus, individuals who experience elevated levels of private self-focus may experience heightened awareness of behaviours and movements in an attempt to maintain the aspect of a movement that is most salient to them (Masters, 1992). In contrast, Fenigstein et al. suggest that those who experience elevated levels of public self-focus generally feel a level of discomfort, and evaluation apprehension because they see themselves as the subject of appraisal. These individuals may experience a broadening of focus, as they scan the environment to focus on those who are watching them (Schwarzer & Jerusalem, 1992). In addition, they may attempt to modify their behaviour to meet the perceived expectations of others. Both private and public self-focus have been shown to have differential effects on performance in pressure-based laboratory studies (Geukes, Mesagno, Hanrahan, & Kellmann, 2013), lending further support for this differentiation in future model development. Consequently, a model that fully differentiates between private and public self-focus should yield a more robust cognitive dimension of competitive anxiety.

In addition to model refinement, one aspect that requires further consideration, but has received little attention is the *specification* of measurement models. Typically, in measurement and conceptual development researchers have focused on the structural elements of models rather than on the direction of the relationships between items and their relevant latent constructs (Jarvis, Mackenzie, & Podsakoff, 2003). In establishing the relationship between constructs and indicators, research has generally relied upon classic test theory (Novick, 1966) and the assumptions this approach adopts regarding the relationships between constructs and their measures. Specifically, classic test theory assumes that the variation in scores on measures is a function of the true score, plus error. Such a specification assumes that meaning flows from the latent construct to the measures, and each measure is viewed as an imperfect reflection of the whole underlying construct. Therefore, any variation in a construct is reflected in variation in its indicators (Bollen, 1989). This type of model is known as reflective and assumes that the same latent construct causes all indicator items. Therefore, all items should be highly correlated and if one item were dropped the construct would not change. Despite the pervasiveness of this approach to model testing, not all latent constructs can be conceived of as being reflected by their first-order subcomponents (Bollen & Lennox, 1991). Rather, it often makes sense to view meaning as emanating from the measure to the latent variable in a definitional sense rather than vice versa (MacKenzie, Podsakoff, & Jarvis, 2005). Such constructs are labelled formative.

This issue has been completely overlooked in sport psychology measurement research, as model testing has typically adopted a Confirmatory Factor Analysis (CFA) approach, which typically specifies models as reflective (Chin, 1998). This potential misspecification in measurement models results in researchers drawing inaccurate conclusions between the structural relationships linking constructs, which, in turn, causes measurement error that has a negative impact upon model testing. For example, MacKenzie et al. (2005) cited the example of transformational leadership as a construct that is traditionally conceptualized as being reflected by charisma, idealized influence, inspirational leadership, intellectual stimulation, and individualized consideration (Bass, 1998). However, Mackenzie et al. convincingly argued that these forms of leadership behaviour are conceptually distinct, are likely to have different antecedents and/or consequences and are not interchangeable. As a result, MacKenzie et al. claimed that transformational leadership would be better portrayed as a formative rather than a reflective construct. MacKenzie et al. noted that the distinction between reflective and formative indicator models can also be generalized to more abstract higher-order factor structures. With hierarchical models, there is also the possibility of multiple first order dimensions serving as either reflective or formative indicators of the higher order constructs. For example, hierarchical models that have formative second order constructs may have first order constructs that consist of reflective items, and vice versa.

Such hierarchical models can make both a theoretical and empirical contribution by better representing complex models (Petter, Straub, & Rai, 2007), a case in point being the competitive anxiety hierarchical model presented here. In the hierarchical model examined in this series of studies, the first order latent constructs (i.e., worry, private self-focus, public self-focus, somatic tension, autonomic hyperactivity and perceived control) are measured by reflective indicators (Diamantopoulos & Winkholfer, 2001). Crucially, each of these constructs has a unique theme that is common to all items purporting to measure it, therefore, the items are interchangeable and unidimensional. Furthermore, it is likely that the reflective indicators within each of the first order latent constructs will co-vary with each other, as suggested by Jarvis et al. (2003). These first order constructs serve as formative indicators for the second-order latent variables, the cognitive, physiological, and regulatory dimensions. These variables are specified as formative as the direction of causality flows from the first to second order constructs, as the first order constructs are defining characteristics of the higher order latent constructs, and changes in these constructs are likely to cause changes to the second order construct. In addition, the first order constructs are also likely to differ between athletes. For example, not all athletes who score highly on private self-focus will score highly on public self-focus and it is entirely possible for athletes to have elevated levels of private self-focus and lower levels of public self-focus and vice-versa. Furthermore, the associated behavioural consequences of these two components may differ as described above. Likewise, both effects specified for self-focus differ from the hypothesized effects of increased worry, which may affect performance on tasks in different ways via different mechanisms (Eysenck, Derekashan, Santos, & Calvo, 2007). Similarly, somatic tension and autonomic hyperactivity are likely to vary in consequences. For example, somatic tension may directly impact upon the processing of movements through increased muscle tension, which might potentially cause degrees of freedom to "freeze" (cf. Vereijken, van Emmerik, Whiting, & Newell, 1992). In contrast, autonomic hyperactivity may have a different effect on performance through physiological reactions involved with the involuntary muscles that are associated with the body's inner organs, such as increased breathing and heart rate. Changes to these functions might affect performance by impacting upon an individual's preferred activation state (Hardy, Jones, & Gould, 1996; Hockey & Hamilton, 1983).

Considering the above arguments, the purpose of the series of studies reported here is to further develop the work of Cheng et al. (2009) by proposing a measurement model that fully represents the lower order constructs of competitive anxiety and more accurately describes the relationships between these lower level constructs and the three primary dimensions. One further point of clarification regards Cheng et al.'s use of the term performance anxiety. We have adopted a more focused terminology, specifically, competitive anxiety, as within the present series of studies all of the participants were athletes taking part in competitive events.

As a preliminary step, we re-examined Cheng et al.'s original hierarchical parcelled model with prospective data to confirm the poor fit already reported by Cheng et al (Study 1, part 1). Secondly, the original item pool was modified and enhanced to represent the separate private and public self-focus constructs within the hierarchical model, and Partial Least Squares (PLS) analysis was conducted to specify a mixed formative and reflective model (Study 1, part 2). Thirdly, this newly developed model was confirmed using a second large prospective data set. The adapted model consisted of six first order reflective constructs; worry, public self-focus, private self-focus, somatic tension, autonomic hyperactivity, and perceived control, which were formatively related to three higher order constructs of cognitive anxiety, physiological anxiety and a regulatory dimension (Study 2). Finally, the predictive validity of the hierarchical model was tested using a performance measure that was derived from both objective and self-report data (Study 3). All three studies use prospective data, that is, data collected an hour prior to a competitive event, to capture how participants felt at that moment regarding the upcoming event.

Study 1: Model development

This study had two objectives, the first of which was to re-evaluate the psychometric properties of the original hierarchical 25 item instrument proposed by Cheng et al. (2009) this time using a prospective data set. The model was specified using traditional reflective methods (CFA) as adopted in the original model. This first part was conducted in order to re-examine the original items guided by the prediction that the analysis would confirm the poor fit reported by Cheng et al. using a dataset collected prior to performance, rather than after the event, a limitation that characterizes Cheng and associates' work. The second objective of this study was to address the issues from part 1 by modifying and enhancing the original item pool to ensure the content was reflective of each of the proposed underlying factors. Additional items were generated to differentiate and truly reflect each of the five first order factors, as well as including more items that reflected both a private and public self-focus. The second objective of this part was to test the model using Partial Least Square (PLS) analysis, which allows the specification of a reflective - formative hierarchical model. PLS was utilised in this step as it is preferred when looking at constructs measured primarily by formative indicators (Haenlein & Kaplan, 2004), as well as allowing the specification of hierarchical models using repeated manifest variables (Wetzels, Odekerken-Schröder, & van Oppen, 2009). In the model proposed here, the first order constructs (worry, self-focus, autonomic hyperactivity, and somatic tension and perceived control) are measured reflectively and then serve as formative indicators of the second order constructs, the cognitive, physiological and regulatory dimensions.

Method

Participants

In total 174 British participants took part in the study, consisting of 97 males and 77 females with a mean age of 37.50 (SD = 11.59). The sample consisted of athletes competing in either running events (n = 121) or triathlons (n = 50). The sample consisted of a wide range of skill levels, including, international and national (n = 19), regional (n = 22), county (n = 26), club (n = 54), or other (n = 51). Participants were all taking part in a competitive event, including half-marathons, 10-kilometre races and full and sprint triathlons, with the average competitive years' experience as 13.74 (SD = 13.01). All participants were English speakers and informed consent was obtained before data collection. Ethical approval for the study was obtained from the institution's ethics committee.

Measures

Part 1: Anxiety Measure. The Three Factor Anxiety Inventory (TFAI) originally constructed by Cheng, Hardy, & Markland, (2009) was used in this investigation. The measure comprises 25 items (see table 1), with 11 items representing the cognitive dimension (worry and self-focus), 8 items representing the physiological anxiety (somatic tension and autonomic hyperactivity), and 6 items representing the regulatory dimension (perceived control). Participants were instructed to complete the measure regarding how they felt at that moment. They were also reminded that their data was confidential, and they should answer as openly and honestly as possible. A 5-point Likert scale was adopted, with 1 representing totally disagree and 5 totally agree. Previous research testing the factorial validity of the English measure produced good fit indices for a three-factor parcelled model, with RMSEA values ≤ .06, CFI values ≥ .97, SRMR values < .08, and robust chi-square ratios ranged from 1.5 to 2.4 (Cheng et al., 2009, Cheng, Hardy, & Woodman, 2011). These validation studies revealed good internal consistency with Cronbach's alpha, of .78 to .87. However, the fit of the original hierarchical model with three second order and five first order factors was unsuccessful due to improper estimates (coefficient values greater than 1.0; Hair, Black, Babin, & Anderson, 2010) between the first and second latent factors in the structural model.

Part 2: Measure refinement. Building on part 1, part 2 involved generating additional items to fully reflect the hierarchical model proposed in this paper. In order to do so, an initial item pool with approximately 85 items was generated to assess worry, public self-focus, private self-focus, autonomic hyperactivity, somatic tension and perceived control. The first stage of this process involved retaining items from Cheng et al.'s (2009) final published model that demonstrated a significant factor loading. Additional items were then generated based on Cheng et al.'s definitions of worry, autonomic hyperactivity, somatic tension and perceived control. In addition, and in contrast to Cheng et al.'s model, self-focused attention was extended to include a distinction between private and public elements of self-focus (Fenigstein, et al., 1975). A range of items were included for each subcomponent to fully capture the dimensions of each construct. To ensure consistency, the original definitions of constructs used by Cheng et al. were adopted for worry, somatic tension, autonomic hyperactivity and perceived control.

For private and public self-focus, the definitions proposed by Fenigstein et al. were adopted. Below, is a definition of each construct:

Worry**:** a cognitive form of apprehension associated with possible unfavourable outcomes.

Private Self-focus**:** concern with attending to one's inner thoughts and feelings.

Public Self-Focus: an awareness of the self as a social object that has an effect on others.

Somatic Tension: physiological reactions involved with the voluntary muscle groups that are motor-oriented.

Autonomic Hyperactivity: physiological reactions involved with the involuntary muscles that are associated with the body's inner organs.

Perceived Control: perception of one's capabilities (involving ability and resource) of being able to cope, and of goal-attainment, regarding the performance of a task under stress.

Each item was evaluated in terms of face validity, clarity of wording, and sentence structure. Items were also assessed for item difficulty (Clark & Watson, 1995), reversed-worded items (Gana, Martin, Canouet, Trouillet, & Meloni, 2002) and item quantity (Smith & McCarthy, 1995). Finally, these combined items were subject to extensive scrutiny by the co-authors: two British Psychological Society Chartered Psychologists and a British Association of Sport and Exercise Science Chartered Sport Scientist. The final item pool of 55 items was agreed by all parties. The final item pool consisted of: 25 items to represent the cognitive dimension (12 items representing worry, 6 representing private self-focus and 7 representing public self-focus); 20 representing the physiological dimension (10 items representing somatic tension and 10 representing autonomic hyperactivity); and 10 representing perceived control.

Procedure

To collect prospective data, we approached the relevant coach, athlete, and organisation before data collection and provided them with study details and a brief overview of the procedures. Following this initial contact, individuals were contacted and were given the opportunity to ask any questions about the study and its procedures. Once participation was agreed, arrangements were made for the researcher to meet with athletes one hour before competition to complete the questionnaire pack. At this stage, informed consent was obtained from all participants. Participants then completed the demographic information and the competitive anxiety measure. Participants were instructed to complete the questionnaire one hour prior to competition and were asked to complete the questionnaire about their feelings towards the upcoming event. All participants were thanked and given contact details if they had any further questions.

Data Analysis

Part 1. The data was analysed using Confirmatory factor analysis (CFA) with the LISREL 9.2 statistics software (Jöreskog & Sorbom, 1993). The analysis was conducted on the full hierarchical model, which is represented by five first order factors and three second order factors. The model was tested using a sequential approach (Jöreskog, 1993; Markland & Ingledew, 1997) to provide a rigorous test of discriminant and convergent validity. At the final stage of testing the model was tested using the parcelled approach (Marsh, Antill, & Cunningham, 1989), due to the relatively small sample size. This method produces item composites of the observed variables for each first-order factor, reducing the number of estimated parameters in the measurement model. According to Marsh et al. these composite variables are more normally distributed and more reliable than the original variables. The item composites were constructed by randomly combining two items from the same subcomponent of anxiety. The model was analysed by a detailed assessment of the standardised factor loadings, the standardised residuals and the modification indices. Global fit indices were examined, in addition a range of fit indices are reported, including the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler, 1990), and the Standardized Root Mean Square Residual (SRMR). Hu and Bentler's (1999) recommendations for good fit were adopted, with cut off value of 0.06 for RMSEA, and 0.95 for CFI, and 0.08 for SRMR.

Part 2. The analysis was performed using Partial Least Squares (PLS), which is a structural equation modelling approach that uses a least squares estimation procedure (Wold, 1974, 1982). The proposed model was tested using the SmartPLS version 2.0 (M3) software (Ringle, Wende, & Will, 2005). The PLS approach maximises the variance of the dependent variables explained by the independent variables, as opposed to reproducing the empirical covariance matrix (Haenlein & Kaplan, 2004). The PLS analysis was conducted using a mix of the repeated indicator approach and the two-stage approach (Hair, Hult, Ringle, & Sarsedt, 2013). The model was specified as a reflective-formative type using the repeated indicator approach (Mode B; Becker, Klein, & Wetzels, 2012). The analysis is reported in two sections, the first estimates the measurement model, while the second focuses upon examining the structural model (Roberts & Thatcher, 2009).

To assess the reflective first order factors, weight relations were analysed. This is known as individual item reliability and is assessed by inspecting the loading of the items on their respective latent variables. It has been suggested that items should be rejected if they have more error variance than shared variance with their latent variable (Hair, Black, Babin, & Anderson, 2010), and thus, only items of .70 or greater should be retained. However, Chin and Newsted (1999) report that PLS structural parameter estimates are more stable and converge better on the true population values with larger numbers of indicators of the latent variables. Based upon Chin and Newsted's recommendation, items of .40 or greater were retained if they were statistically significant. Secondly, analysis of how latent variables and indicators were related was achieved by an examination of convergent validity and discriminant validity of the scales. Composite reliability (CR) assessed internal consistency as it is considered superior to Cronbach's alpha reliability coefficient (Peterson & Kim, 2013) and provides a better estimate of variance shared by a set of indicators because it uses item loadings to calculate their internal consistency. It has been suggested that a CR of .70 or higher represents acceptable internal consistency (Fornell & Larcker, 1981). The average variance extracted (AVE) for scales was used to assess convergent validity. This statistic refers to the average amount of variance in a set of indicators explained by their latent variables, this should be at least .50 or greater (Fornell & Larcker, 1981). As well as examining cross loadings, the AVE statistic can also be used to calculate discriminant validity. Fornell and Larcker (1981) suggest that a latent variable should better explain the variance of its own indicators than the variance of other latent variables. Hence, the square root of each construct's AVE should be greater than its highest correlation with any other construct in the model.

The second step was to examine the structural part of the model, which tests the relationship between the latent variables. The cognitive dimension, physiological dimension and regulatory dimension were modelled as formative second order latent variables. When assessing structural models with formative constructs the standardized path coefficients are assessed to examine their significance. This evaluates the strength of the relationship between the focal formative construct and related endogenous constructs (Roberts & Thatcher, 2009). If structural paths were significant these paths were retained in the model, and further examination of the standardised path coefficients (β) took place to examine the relative contribution of each factor. When using the repeated indicators approach with higher order constructs that are formative, the lower order constructs already explain all the variance of the higher order constructs. Therefore, the variance explained (R^2) in the endogenous construct will typically equal 1.0 (Becker, Klein, & Wetzels, 2012), and so is not reported in this analysis. To generate a test of significance, SmartPLS implements a bootstrapping procedure. Means and standard errors for the PLS estimates are generated and these are tested for significance by the *t*-statistic. In the present analyses 5000 bootstrap samples with replacement were requested.

Results

Step 1

Inspection of the univariate normality of all items for skewness (values ranged from -.60 to 1.32) and kurtosis (values ranged from -.80 to 1.52) revealed some violation (values greater than 1 indicating violations to skewness and kurtosis; Bulmer, 1979), so that the multivariate distributions were significantly non-normal. Consequently, the Robust χ^2 was adopted as a method of correcting the χ^2 statistic for non-normality (Chou & Bentler, 1995). The full hierarchical model with three second order and five first order factors exhibited a poor fit to the data, with Robust χ^2 (30) = 333.84, $p < .001$; RMSEA = .14, CFI = .56 and SRMR = .14. Reflecting Cheng et al.'s work, this model also produced some improper estimates (coefficient values greater than 1.0; Hair, Anderson, Tatham, & Black, 1998). The inter factor correlations between the three dimensions of anxiety were -.49 between the cognitive and physiological dimensions, -.92 between the cognitive and regulatory dimensions and .85 between the physiological and regulatory dimensions. In addition, several of the factor loadings for the 25 items (see table 1) were below .40. To replicate the steps taken by Cheng et al., the model was also tested as a three-dimensional parcelled model, which revealed a better, although still unsatisfactory, fit to the data, with Robust χ^2 (35) = 183.30, $p < .001$; RMSEA = .10, CFI = .73 and SRMR = .11. Furthermore, 5 items had factor loadings below .20, which is also indicative of a poor fit.

Step 2

The PLS analysis revealed some issues with the factor loadings of the 55-item scale (table 2). Overall, 12 items had loadings that were less than .40, 11 items had loadings that were below .70, and the remaining 32 items all had loadings greater than .70. Several factors had unacceptable CR values as well as AVE's values less than .50 (see table 3). Discriminant validity was established using the squared root of the AVE'S for each latent variable against the bivariate correlations of all other variables (table 4). Again, several factors violated discriminant validity, in that some bivariate correlations were greater than the squared root of the AVE of the latent variable (table 4). In addition, one of the structural path coefficients from the lower order to the second order constructs in the proposed hierarchical model were not significant ($p < 0.05$, see table 5).

The model was refined for further testing and inspection of the item loadings and factor properties revealed a better fit. More precisely, following a process of item deletion, a model represented by 25 items presented the most robust measurement model (table 2). All item loadings were greater than .40, and only 5 items had loadings below .70. All factors had acceptable AVE and CR values (table 3); however, similar to the aforementioned discriminant validity analysis, some bivariate correlations were greater than the squared root of the AVE of the latent variable. Specifically, between worry and private and public self-focus, and between somatic tension and autonomic hyperactivity (table 4). When examining the structural properties, the path coefficients presented a much more positive model. All path coefficients were significant from the first to second order factors (table 5).

Discussion

The aim of study 1 was firstly to re-test the original hierarchical model proposed by Cheng et al. (2009) with prospective data. Analysis was conducted using a traditional reflective CFA approach. Replicating Cheng et al.'s findings, the results from the CFA revealed a poor fit to the proposed hierarchical model. The same parcelling method utilized by Cheng et al. was adopted in this analysis, the limitations of which have been reported by Marsh, Lüdtke, Nagengast, Morin, & Von Davier (2013). However, for the purposes of replication, following the same procedures used by Cheng et al was considered an important step in developing the rationale for alternative analysis procedures. Subsequently, in part 2 of this study we took several steps to attempt to address the issue of poor fit, the first being specification of the model using a mixture of reflective and formative constructs in order to produce a more robust model that better reflects the complex dynamics of the anxiety response. We also took this opportunity to address conceptual issues within the original model by extending the cognitive dimension to include the private and public self-focus distinction proposed by Fenigstein, Scheier, and Buss (1975). Therefore, the objective of step 2 was to modify and extend the hierarchical model of competitive anxiety. The items were refined, and the cognitive dimension of the hierarchical model was extended to include a private and a public self-focus. Therefore, the proposed model consisted of six reflective constructs (worry, self-focus, autonomic hyperactivity, somatic tension and perceived control), which served as formative indicators of the second order constructs (cognitive, physiological and regulatory dimensions). The final 25 items revealed a good fit to the data, while also providing a measure that could be easily administered to athletes. In total 11 items were retained from Cheng et al.'s model, the remaining 14 were newly developed items. However, there were some violations to discriminant validity, thus further testing of the model was required. Some of these violations might have been due to peculiarities in this relatively small and homogeneous sample, which might dissipate if the model was tested with a large more heterogeneous sample. Consequently, a second study using a larger prospective heterogeneous sample was used to further test the proposed hierarchical model.

Study 2: Testing the model

Method

Participants

In total 516 British participants took part in this study. The sample included both male (n = 174) and female athletes (n = 342), who competed in a variety of sports (Archery = 40, Badminton = 22, Basketball = 42, Cheerleading = 6, Football = 40, Hockey = 31, Karate = 8, Netball = 240, Rugby = 57, Touch Rugby = 14, Volleyball = 16). Participants competed at the following performance levels, international (n = 73), national (n = 83), regional (n = 118), county (n = 166), or club (n = 76). Participants were all taking part in a competitive event (International = 30, university = 312, regional = 116, league = 58), with the mean competitive years of experience as 9.35 (SD = 4.64). All participants were English speaking and informed consent was obtained before data collection. Ethical approval for the study was obtained from the institution's ethics committee.

Measure

Anxiety. The 25-item hierarchical model developed in study 1, part 2 was used in this study.

Procedure

As in the previous studies, the same prospective data collection procedure was utilised.

Data Analysis

The PLS analysis used in study 1 was employed.

Results

Analysis revealed that all item loadings were greater than .40 and significantly greater than zero in all cases (table 6). Only three loadings were below .70, one of which ("I have a slight tension headache") was also below .70 in study 1. Acceptable convergent validity was also achieved as all lower order constructs within the measurement model had CR values greater than .70, and all lower order constructs had AVE's greater than .50 (see table 3). Discriminant validity was examined by comparing the square rooted AVE'S for each latent variable against the bivariate correlations of all other variables (table 7). All latent variables demonstrated adequate discriminant validity, apart from autonomic hyperactivity, with somatic tension. However, on further assessment of the item cross loadings, none of the items correlated more strongly with the other construct than their own construct, thus there was no violation across items. The Fornell-Larcker approach is a very conservative test of discriminant validity (Chin, 2010); therefore, based on inspection of the item cross loadings, all latent variables were considered to demonstrate adequate discriminant validity. With this in consideration, and in view of the results taken together, these findings suggest that the measurement model was acceptable.

With regards to the structural properties of the hierarchical model, the results reveal that all path coefficients were significant in the proposed model (see table 5). The first order factors, reflectively measuring the constructs of worry, private self-focus, and public self-focus were all significantly and positively related to the cognitive factor. Likewise, somatic tension and autonomic hyperactivity were significantly and positively related to the physiological factor.

Discussion

The aim of study 2 was to test the final 25 item hierarchical model presented in study 1, part 2, which consisted of six reflective constructs (worry, self-focus, autonomic hyperactivity, somatic tension and perceived control), which served as formative indicators of the second order constructs (cognitive, physiological and the regulatory dimension). The PLS results revealed good item loadings for the 25 items and support for a fully differentiated hierarchical model. All structural paths were significant, which supports a model that consists of first order reflective constructs and second order formative constructs. This is a novel development in the anxiety measurement literature, as it is the first time a model has been specified in such a way. To provide further support for this model, study 3 aimed to establish how the lower order factors from this model can help explain athletes' performance. We predicted that higher performance levels during a competition would be associated with lower levels of precompetitive cognitive and physiological anxiety and higher levels of perceived control when compared with poorer performance.

Study 3: Establishing predictive validity

Method

Participants

The full sample consisted of 104 British athletes (*M* = 37.58, SD = 11.71) who were assigned to one of three (high, moderate, and low) groups according to their score on the self-reported performance measure (see below). The high-performance group consisted of 24 athletes, the moderate group 61 athletes, while the low performing group contained 19 athletes. The final sample consisted of the two extreme groups, i.e., those in the high (n = 24) and low performing groups (n = 43). This final sample included both male (n = 24) and female (n = 17) athletes with an average age of 36.21 (SD = 12.51). Athletes were either taking part in a competitive running race (n = 28) or triathlon (n = 18) and had an average competitive experience of 15.88 years (SD = 13.22). All participants were English speaking and informed consent was obtained before data collection. Ethical approval for the study was obtained from the institution's ethics committee.

Measures

Anxiety. The final hierarchical model presented in study 2 was used in this study.

Performance. In line with previous research (Cheng, Hardy, & Woodman, 2011; Hardy & Hutchinson, 2007), a self- report measure of performance was designed specifically for this study. In contrast to previous research, this measure was derived from a subjective measure of performance as well as two dichotomous questions that established whether the athletes had achieved a personal best and achieved their personal goals in the event they had just completed. To capture the subjective element of performance, athletes completed a 6-item measure, which was developed with the assistance of running and triathlon coaches and athletes (n = 38) who were contacted and asked to provide a list of factors that they considered to be indicative of superior performance. This list was then reviewed by the research team and two international level coaches before the 6 items were agreed. The scale consisted of the following items: (a) I remained focused throughout the race; (b) I executed a well-paced and consistent race; (c) My fuel and hydration strategies were effective; (d) During the race, I established a good rhythm throughout; (e) I remained motivated and determined throughout; (f) I employed effective in-race strategies to complete the race well. These items were rated on a 5-point Likert scale from 1 (least satisfactory) to 5 (highly satisfactory). Total scores ranged from 6 to 30. The performance measure was pilot tested on 4 athletes from the target population to ensure clarity of wording and ease of use of the scale. Factor validity of the single factor scale was examined, and the results revealed item loadings from .86 to .72, and composite reliability of .90 Participants were separated into high and low performance groups based on the following three aspects of performance; a) did they achieve a personal best, b) did they achieve their goals, c) the overall score on the 6-item performance measure. Individuals were placed into the good performance group if they reported yes to the first two questions and received a score over 25 on the performance measure. Individuals were placed in the poor performance group if they reported no to both questions and received a score below 20 on the performance questionnaire.

Procedure

The same procedure as the studies reported earlier was adopted, with the addition of the collection of performance data. Specifically, athletes were informed that they were required to complete a short performance measure following the event that they were taking part in. Immediately after the competitive event, athletes were asked to fill out the brief performance measure. They were then thanked and debriefed on the purpose of the study.

Data Analysis

A one-way MANOVA compared the levels of precompetitive anxiety between the high and low performing groups. The independent variable, performance level, was based on performance recorded at the same event at which the pre-competition anxiety was measured The six first-order variables of the competitive anxiety model (i.e., worry, private self-focus, public self-focus, somatic tension, autonomic hyperactivity, perceived control) served as dependent variables.

Results

All of the assumptions underlying the use of MANOVA were met. The MANOVA revealed a significant effect for performance level, Wilks = 0.74, F (6, 40) = 2.33, $p < .05$, partial $\eta^2 = .259$. Follow-up one-way ANOVA's were conducted on each of the six dependent variables. The tests revealed a significant effect for the control factor only, F (1, 99) = 9.79, $p < 0.01$, $\eta^2 = .20$, with those achieving high performance reporting significantly higher levels of perceived control than those who performed poorly.

Discussion

The aim of study 3 was to establish whether the lower order factors from this model were related to athletes' performance. The results revealed that those who performed well had higher levels of perceived control. This provides only partial support for the predictive validity of the model; however, this finding does lend support to previous research that also demonstrated that higher levels of perceived control lead to better performance (Cheng, Hardy, & Woodman, 2011). The absence of any differences between High and Low performing athletes in terms of cognitive and physiological anxiety is in line with much of the literature in this area (e.g., Edwards & Hardy, 1996; Gould, Petlichkoff, Simons, & Vevera, 1987) and forms the basis of including the regulatory dimension, which accounts for the sometimes adaptive nature of the anxiety response.

General Discussion

The purpose of the present series of studies was to develop and extend the work of Cheng et al. (2009) and validate a hierarchical model of competitive anxiety based on their original model. Study 1 confirmed that the model proposed by Cheng et al. required further attention. Echoing Cheng et al.'s results, a number of the items reported poor loadings, thus the measurement model was refined and examined as a mixed reflective-formative hierarchical model. The results of the initial 55 item measure revealed poor measurement and structural fit statistics, but a smaller 25 item measure provided good fit statistics. Study 2 revealed support for the differentiated hierarchical model represented by the five underlying subcomponents. The model presented here is in line with Cheng et al.'s (2009) originally proposed five factor hierarchical model. Study 3 distinguished between athletes who have performed well and those who have not performed well. The results revealed that good performance was associated with higher pre-competition levels of the first order factor of perceived control.

The current research represents an important step in developing a valid hierarchical model of competitive anxiety. The results support the adoption of a hierarchical structure, with six lower order reflective constructs and three higher order formative constructs. In contrast to Cheng et al.'s (2009) analysis, the results of the current study were able to support a hierarchical structure. Thus, the results add support to the re-conceptualization of model proposed by Cheng et al., whilst also providing support for the multidimensionality associated with both the cognitive and physiological dimensions. Theoretically, this allows for greater differentiation in our understanding of each dimension of competitive anxiety, which will allow more meaningful testing of theories. Despite these positive findings, there remains some uncertainty about the nature of the cognitive dimension. Structurally, the private and public self-focus factors appear to load weakly onto cognitive anxiety. Whilst all the structural paths make a contribution to the higher order construct of cognitive anxiety, the nature of this dimension could be further explained by a second level within the cognitive dimension. Specifically, the cognitive dimension could contain one overarching dimension of self-focus formed by private and public components at a lower level. Future research could test this proposition and ensure that the factors that form the cognitive dimension fully encompass the whole anxiety response (Derakshan & Eysenck, 2001).

In addition to the issues outlined with the cognitive dimension, the measurement results of study 2 revealed a violation of inter-item correlation between somatic tension and autonomic hyperactivity. The approach of measuring perceptions of physiological anxiety in performance contexts has previously received criticism (e.g., Woodman & Hardy, 2001) and research has demonstrated that individuals are poor at accurately reading their own physiological symptoms, unless trained to do so (e.g., Yamaji, Yokota, & Shephard, 1992). Therefore, measuring physiological symptoms via self-report instruments may not be the most effective method, which may go some way to explain the issues reported here. Consequently, further validation of the physiological dimension alongside a greater understanding of the interoceptive capabilities of individuals may be required (Craig, 2002).

In terms of perceived control, the results provide further support for the integration of a regulatory dimension in a model of competitive anxiety. In addition, these results support Cheng, Hardy, and Woodman's (2011) predictive validity study, which found perceived control to be the single best predictor of

. It appears that perceived control might be the most important constituent of the performance anxiety relationship, further highlighting the adaptive potential of the regulatory dimension. Further studies are required to explore the adaptive nature of the perceived control construct, the conceptualization of which in this series of studies is in line with that adopted by Cheng and colleagues. Specifically, perceived control in this context evolved from Carver and Scheier's conceptualization of the construct within their control-process model of anxiety and is specifically related to an individual's perception of their capacity to be able to cope and attain goals under pressure (Cheng et al., 2009, p. 273). Of course, the construct of control is potentially much wider in scope and has been linked to other emotions (e.g., Izard & Ackerman, 2000) and future research might also focus on how the specific construct of control adopted in this series of studies relates to other, perhaps wider notions of control.

Despite the attempt to record more objective performance data by asking athletes if they had achieved their personal best, other, more subjective questions formed the basis of the performance measure in Study 3. Consequently, there remains the issue of social desirability when using self-report measures. Composite indices of performance comprising objective and self and coach rated measures may help researchers build up a more holistic and reliable picture of "performance" that is more sensitive to fluctuations in competitive anxiety. Furthermore, apart from the regulatory dimension, the current research did not find any significant effects for any of the other first order factors in the model. To continue to support the hierarchical model presented in this research, future studies should continue to look for effects at the lower order and should consider using more sophisticated analysis to accomplish this goal, such as pattern recognition techniques (Witten, Frank, Hall, & Pal, 2016).

All 733 participants in the series of studies reported here were athletes from a variety of sports who competed at a number of ability levels. Similarly, Cheng and associates (2009, 2011, 2015), focused their efforts on collecting data from competitive athletes, 1992 in total, again from a range of sports and competitive levels. Within Cheng et al.'s (2015) sample, there were 485 dancers, but these were also performing in a dance competition. Thus, the focus of all of the research thus far has been on athletes in competitive situations. Future research should seek to examine the generalizability of the three-dimensional model to other potentially stressful environments, for example, using military personnel or musicians.

From a measurement perspective, the results of the PLS analysis suggest that modelling competitive anxiety using a mixture of reflective and formative methods may provide a more accurate reflection of the factors associated with the competitive anxiety response. Moreover, the results provide clear support for modelling the relationship between the lower order and higher order constructs as formative. This is crucial as the lower order constructs of worry, private self-focus, public self-focus and of somatic tension and autonomic hyperactivity are conceptually distinct, are likely to have different antecedents/consequences, and are not interchangeable. Therefore, adopting a formative approach will reduce the potential for misspecification of relationships between constructs and the associated measurement error. This will result in researchers specifying appropriate relationships and making accurate conclusions about the structural relationships between constructs. To further explore the hierarchical model researchers should examine relationships between the first order constructs of this model with other measures to establish further validity.

Partial least squares has become a viable estimator for testing theoretical models in psychological research (Bollen & Diamantopoulos, 2017). However, this form of analysis is not commonly seen in the sport psychology literature, nonetheless the authors feel that this approach to model specification has the potential to have a significant impact on model testing. One reason for its absence might be due to the lack of clear guidelines when testing more complex models. The model proposed here used a combination of reflective and formative methods; yet similar models in the literature often fail to provide details on how models were specified (Becker, Klein, & Wetzels, 2012). The debate on this form of model specification is ever changing, thus future testing using this approach, should be mindful of further developments in model testing procedures.

Whilst greater differentiation may prove useful in theoretical terms, there is also practical significance in these findings. The differentiated approach afforded in this model permits greater understanding of an individual's response. Consequently, if a more refined diagnosis of anxiety can be made; sport psychologists can adopt more precise intervention strategies to facilitate task success in pressure situations. For example, athletes who report high scores on the private self-focus subscale might benefit from using holistic process goals to prevent lapses into conscious control (Mullen, Jones, Oliver, & Hardy, 2016). In contrast, athletes who report elevated levels of autonomic hyperactivity may benefit from a relaxation-based strategy focused on rhythmic breathing, which could decrease an individual's breathing and heart rate.

In conclusion, the studies reported here provide support for a differentiated hierarchical model of competitive anxiety. The refinement of the measure and the addition of a private and public self-focus strengthen the model's validity and provide a deeper understanding of the competitive anxiety response. This differentiated approach at the first order level has the potential to make a significant impact on both theoretical testing in the competitive anxiety literature and on the practice of applied sport psychologists.

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Table 1. Study 1, part 1 factor loadings

Items	Factor loadings
Worry	
I am worried that I may make mistakes	.81
I am worried about the uncertainty of what may happen	.76
I am worried that I may not perform as well as I can	.13
I am worried about the consequence of failure	.81
Self-Focus	
I tend to dwell on shortcomings in my performance	.59
I am aware that I will be conscious of every movement I make	.48
During my performance I will evaluate myself more critically	.00
I am conscious that people might disapprove of my performance	.76
I dwell on how I might not impress important others	.91
I am very aware of the possibility of disappointing important others	.88
I am conscious that others will be judging my performance	.48
Somatic Tension	
I feel easily tired	.74
I feel restless	.72
I have a slight tension headache	.14
My body feels tense	.81
Autonomic Hyperactivity	
My mouth feels dry	.18
My heart is racing	.45
I feel the need to go to the bathroom more often	.55
My hands are clammy	-.01
Perceived Control	
I feel ready for my performance	.78
I believe in my ability to perform	.81
I believe my performance goal is achievable	.56
I believe that I have the resources to meet this challenge	.73
I am confident that I can stay focused during my performance	.64
I feel confident about my upcoming performance	.84

Table 2. Study 1, part 2 PLS factor loadings

Items	Factor loadings	
	Study 2a	Study 2b
Worry		
I am worried that I may make mistakes	.81	.85
I am worried about the uncertainty of what may happen	.81	.79
I am worried about the consequence of failure	.85	.83
I am worried that I may not perform to the best of my ability	.21	.83
I am worried about the outcome of my performance	.11	.83
I am worried that I may not meet the expectations of important others	.75	
I am worried that I may not perform as well as I can	.17	
I am worried because I don't know what to expect	.79	
I am worried that others will be disappointed with my performance	.23	
I am worried because I can not predict the performance result	.78	
I am worried about what may happen if things to not go well	.87	
I am worried that things are going to go wrong	.73	
Private Self-Focus		
I tend to dwell on shortcomings in my performance	.82	.83
I am aware that I will be conscious of every movement I make	.64	.69
I am aware that I will scrutinise my performance	.68	.74
During my performance I will evaluate myself more critically	-.21	
During the performance I will be instructing myself what to do	.17	
I am aware that I will focus on the weaknesses in my performance	.8	
Public Self-Focus		
I am conscious about the way I will look to others	.73	.83
I am conscious that others will be judging my performance	.79	.87
I am worried that I might not meet the expectations of important others		.85
I dwell on how I might not impress important others	.88	
I am very aware of the possibility of disappointing important others	.83	
I am aware that other are going to evaluate me critically	.87	
I am aware that pople will be watching me	.18	
I am conscious that people might disapprove of my performance	.82	
Somatic Tension		
I have a slight tension headache	.17	.62
My body feels tense	.84	.83
I feel physically nervous	.09	.79
I find myself trembling	.77	.8
I feel lethargic	.73	.72
I feel easily tired	.75	
I feel restless	.69	
I feel my body feeling shaky	.83	
I am suffering from a headache	.61	
My body feels tight	.51	
Autonomic Hyperactivity		

My hands are clammy	-.07	.82
My heart is racing	.63	.61
My chest feels tight	.77	.73
I feel tense in my stomach	.79	.81
I feel a lump in my throat	.74	.83
My mouth feels dry	.21	
I feel the need to go to the bathroom more often	.56	
My palms are sweaty	.14	
I feel difficulty breathing	.67	
My heart rate has increased	.74	
Perceived Control		
I believe in my ability to perform	.84	.9
I am prepared for my upcoming performance	.66	.58
I am confident that I will be able to reach my target	.72	.69
I feel I have the capacity to cope with this performance	.77	.85
I feel ready for my performance	.8	
I believe my performance goal is achievable	.66	
I believe that I have the resources to meet this challenge	.76	
I am confident that I can stay focused during my performance	.67	
I feel confident about my upcoming performance	.82	
I believe I have the skills to be successful in my competition	.73	

Table 3. Quality overview

First-order constructs	Study 1 (part 2a)		Study 1(part 2b)		Study 2	
	AVE	CR	AVE	CR	AVE	CR
Worry	.44	.66	.69	.91	.60	.88
Private self-focus	.37	.60	.57	.80	.55	.79
Public self-focus	.58	.76	.72	.88	.63	.84
Somatic tension	.42	.64	.58	.87	.53	.84
Autonomic Hyperactivity	.35	.59	.58	.87	.55	.85
Perceived Control	.56	.92	.59	.85	.59	.85

Note. AVE = Average variance extracted; CR = Composite reliability**.**

Table 4. Study 1 (part 2) latent variable correlations

First-order Construct	1	2	3	4	5	6
1.Worry	**.66**	.74	.84	.71	.68	-.54
2. Private self-focus	.74	**.60**	.61	.56	.51	-.36
3. Public self-focus	.84	.67	**.76**	.57	.53	-.39
4. Somatic tension	.41	.55	.61	**.64**	.86	-.57
5. Autonomic Hyperactivity	.68	.52	.60	.89	**.59**	-.56
6. Perceived Control	-.57	-.33	-.45	-.52	-.52	**.74**

Note. Squared root AVE are presented in bold on the diagonal line. Latent variable correlations for the 55 item (part 2a) model is presented below the diagonal, whilst the 25 item (part 2b) model is presented above the diagonal. (i.e., weak – 0.20, moderate – 0.50, and strong – 0.80)

Table 5. Path coefficients

Relationship	**Study 1 (part 2a)**	**Study 1(part 2b)**	**Study 2**
Worry - > Cognitive	1.12*	.69*	.69*
Private Self-focus -> Cognitive	-.04	.17*	.25*
Public Self-focus -> Cognitive	-.13*	.20*	.16*
Somatic tension -> Physiological	1.24*	.74*	.51*
Autonomic Hyperactivity -> Physiological	-.32*	.27*	.53*
Perceived Control -> Regulatory	.30*	.21*	.22*

Note. * = significant path coefficients, p < .05.

Table 6. Study 2 PLS factor loadings

Items	Factor loadings
Worry	
I am worried that I may make mistakes	.80
I am worried about the uncertainty of what may happen	.72
I am worried about the outcome of my performance	.84
I am worried that I may not perform to the best of my ability	.78
I am worried about the consequence of failure	.74
Private Self-Focus	
I tend to dwell on shortcomings in my performance	.75
I am aware that I will scrutinise my performance	.77
I am aware that I will be conscious of every movement I make	.71
Public Self-Focus	
I am conscious about the way I will look to others	.77
I am conscious that others will be judging my performance	.82
I am worried that I may not meet the expectations of important others	.79
Somatic Tension	
I feel physically nervous	.75
I find myself trembling	.76
I have a slight tension headache	.67
I feel lethargic	.62
My body feels tense	.80
Autonomic Hyperactivity	
My chest feels tight	.73
I feel tense in my stomach	.83
My heart is racing	.71
I feel a lump in my throat	.73
My hands are clammy	.69
Perceived Control	
I believe in my ability to perform	.84
I am prepared for my upcoming performance	.70
I am confident that I will be able to reach my target	.72
I feel I have the capacity to cope with this performance	.79

Table 7. Study 2 latent variable correlations

First-order Construct	1	2	3	4	5	6
1.Worry	**.77**					
2. Private self-focus	.56	**.74**				
3. Public self-focus	.70	.57	**.79**			
4. Somatic tension	.53	.4	.44	**.72**		
5. Autonomic Hyperactivity	.51	.36	.40	.82	**.74**	
6. Perceived Control	-.34	-.21	-.35	-.35	-.28	**.76**

Note. Squared root AVE are presented in bold on the diagonal line. (i.e., weak – 0.20, moderate – 0.50, and strong – 0.80)

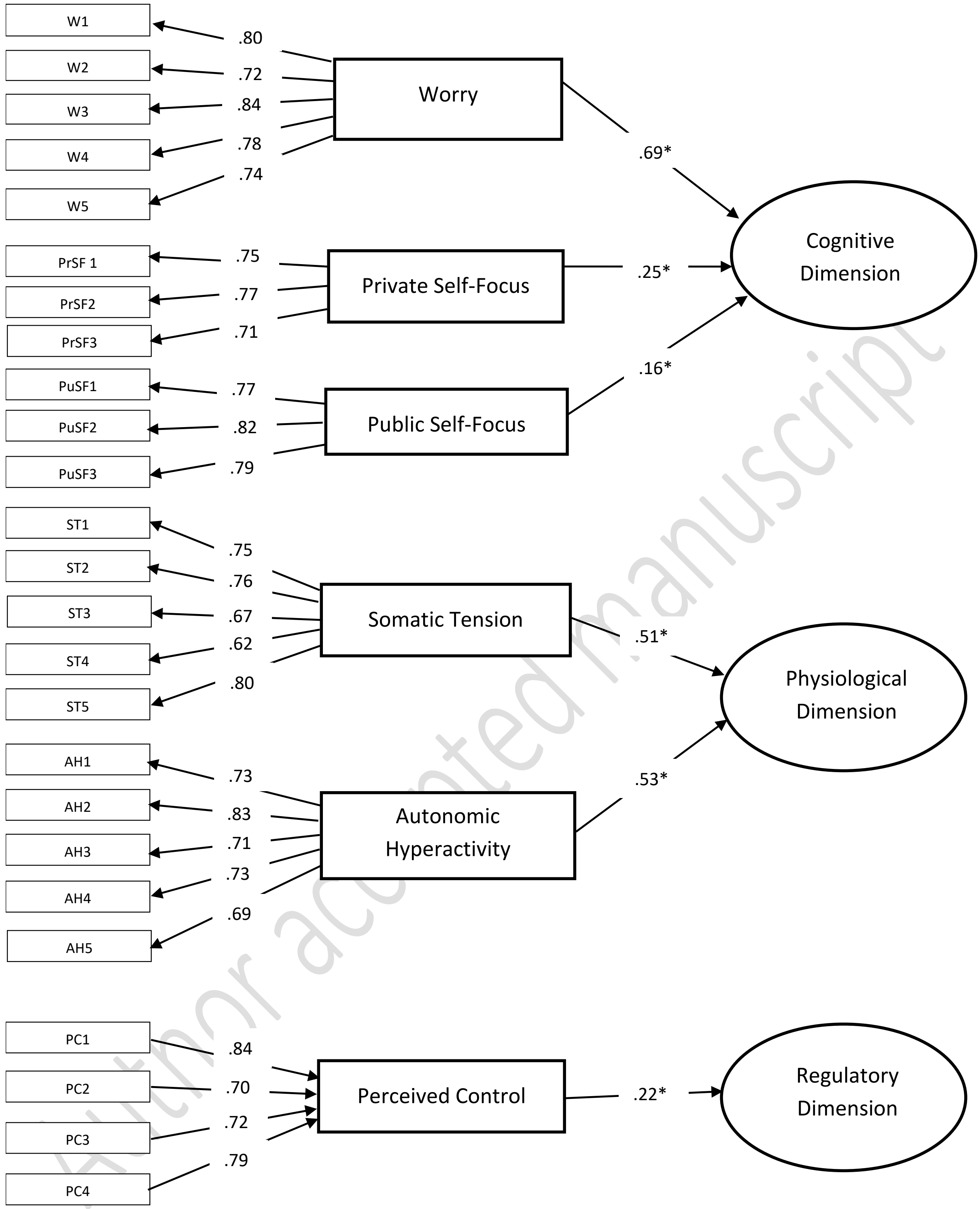

Figure 1. Results of the PLS model for the final 25 item model presented in study 2 with factor loadings and path coefficients. *Note.* For the path coefficients, the estimate is the PLS estimate, $p < .05$.

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